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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/623,375	07/18/2003	Vladimir A. Dmitriev	2023600-7006254001	3202

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EXAMINER

SONG, MATTHEW J

ART UNIT

PAPER NUMBER

1765

DATE MAILED: 12/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

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<b>Office Action Summary</b>	<b>Application No.</b> 10/623,375	<b>Applicant(s)</b> DMITRIEV ET AL.	
	<b>Examiner</b> Matthew J Song	<b>Art Unit</b> 1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 29 March 2004.  
2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-34 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1-34 is/are rejected.  
7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.  
10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All    b) ☐ Some \*    c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>9/15/2004</u> . | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Double Patenting*

1. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

2. Claims 1-18 and 21-34 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-27 of U.S. Patent No. 6,613,143. Although the conflicting claims are not identical, they are not patentably distinct from each other because US 6,613,143 claims a Ga source, where two portions of the source are heated to different temperatures (claims 1 and 21), which reads on applicants' first and second Group III sources. US 6,613,143 also claims a first and second growth zone and transferring a substrate between growth zones to grow portions of a GaN single crystal in each zone by reacting the halide metal compound with a reaction gas (claim 1, 6 and 21). US 6,613,143 also claims introducing a halide reaction gas into the first source zone to form a halide metal compound (claim 1), this reads on applicants' reacting the source with a halide gas.

US 6,613,143 does not claim transferring the substrate to the second growth zone, wherein the temperature corresponding to the substrate varies by less than 200°C during the

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transferring step. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify US 6,613,143 by minimize any temperature fluctuations during the transfer step to less than 200°C to maintain the temperature of the substrate close to the deposition temperature to prevent the need to reheat the substrate to the deposition temperature and because temperature fluctuations during growth processes are known to be undesirable in regard to yield.

3. Claims 1-18 and 21-34 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-35 of U.S. Patent No. 6,573,164. Although the conflicting claims are not identical, they are not patentably distinct from each other because US 6,573,164 claims in claims 1 and 35:

- locating a first Group III metal in a first source zone of a HVPE reactor;

- locating a second Group III source within the reactor;

- heating the first and second Group III metal to different temperatures;

- heating a growth zone to a first temperature;

- introducing a halide reaction gas to the first zone to form a Group III metal halide;

- transporting the first Group III metal halide compound to the growth zone;

- transporting a reaction gas into the growth zone;

- growing a first layer by reacting the Group III metal halide compound with the reaction gas;

- transferring the substrate to a growth interruption zone, wherein temperature is within 50°C of the first temperature, this reads on applicants' transferring the substrate to a growth

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zone, wherein a substrate temperature varies by less than 200°C during transferring because the temperature of the interruption zone is close to the growth zone temperature;

introducing a halide reaction gas to the second zone to form a Group III metal halide;

transporting the second Group III metal halide compound to the growth zone;

transporting a reaction gas into the growth zone;

transporting the substrate from the growth interruption zone to the growth zone;

growing a second layer by reacting the Group III metal halide compound with the reaction gas.

US 6,573,164 claims a single growth zone. US 6,573,164 does not claim a second growth zone, wherein the first and second growth zones are different growth zones. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify US 6,573,164 by adding a second growth zone because duplication of parts is held to be obvious (MPEP 2144.04).

Referring to claim 2-3, US 6,573,164 claims a interruption zone and inert gas flow (claim 1).

Referring to claims 4-5, US 6,573,164 claims stabilizing the reaction (claim 3).

Referring to claim 6-8, US 6,573,164 claims maintaining the interruption zone within the claim range, which will prevent the temperature of the substrate from varying during the transferring step.

Referring to claim 9-11, US 6,573,164 is silent to the thickness of the deposited layer. Thickness of the deposited layer is a matter of design choice and is within the skill of an ordinary person skilled in the art.

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Referring to claim 12-14, US 6,573,164 claims inert gas flow angles (claim 8-10).

Referring to claim 15-18, US 6,573,164 claims additional sources (claim 25-34).

Referring to claim 21-34, US 6,573,164 claims transferring impurity metal (claim 15-24).

4. Claims 19-20 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-35 of U.S. Patent No. 6,573,164 in view of Kiyoku et al (US 6,153,010). US 6,573,164 teaches all of the limitations of claim 19, as discussed previously, except US 6,573,164 does not teach growing a buffer layer prior to growing the first layer.

In a method of growing nitride semiconductors, note entire reference, Kiyoku et al teaches a buffer layer 12 of a single layer structure and the buffer layer eases the lattice mismatch between the dissimilar substrate 11 and the nitride semiconductor grown on the buffer layer 12. Kiyoku et al also teaches the buffer layer is made of undoped GaN and the nitride semiconductor is made of  $\text{Al}_x\text{Ga}_{1-x}\text{N}$  ( $0 \leq x \leq 0.5$ ). Kiyoku et al also teaches the underlayer and nitride semiconductor can be made by HVPE (col 5, ln 1-35 and col 9, ln 55-60). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify US 6,573,164 with Kiyoku et al's buffer layer to reduce lattice mismatch between the substrate and nitride semiconductor.

Claims 1-18 and 21-34 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-35 of U.S. Patent No. 6,573,164 in view of U.S. Patent No. 6,613,143.

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US 6,573,164 teaches all of the limitations of claim 19, as discussed previously, except US 6,573,164 claims a single growth zone. US 6,573,164 does not claim a second growth zone, wherein the first and second growth zones are different growth zones.

US 6,613,143 claims a Ga source, where two portions of the source are heated to different temperatures (claims 1 and 21), which reads on applicants' first and second Group III sources. US 6,613,143 also claims a first and second growth zone and transferring a substrate between growth zones to grow portions of a GaN single crystal in each zone by reacting the halide metal compound with a reaction gas (claim 1, 6 and 21). US 6,613,143 also claims introducing a halide reaction gas into the first source zone to form a halide metal compound (claim 1), this reads on applicants' reacting the source with a halide gas. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify US 6,573,164 with US 6,613,143 second growth zone to grow a second layer at a different growth rate.

Claims 19-20 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-35 of U.S. Patent No. 6,573,164 in view of U.S. Patent No. 6,613,143, as applied to claims 1-18 and 21-34 above, and further in view of Kiyoku et al (US 6,153,010). The combination of US 6,573,164 and US 6,573,164 teaches all of the limitations of claim 19, as discussed previously, except the combination of US 6,573,164 and US 6,573,164 does not teach growing a buffer layer prior to growing the first layer.

In a method of growing nitride semiconductors, note entire reference, Kiyoku et al teaches a buffer layer 12 of a single layer structure and the buffer layer eases the lattice

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mismatch between the dissimilar substrate **11** and the nitride semiconductor grown on the buffer layer **12**. Kiyoku et al also teaches the buffer layer is made of undoped GaN and the nitride semiconductor is made of  $\text{Al}_x\text{Ga}_{1-x}\text{N}$  ( $0 \leq x \leq 0.5$ ). Kiyoku et al also teaches the underlayer and nitride semiconductor can be made by HVPE (col 5, ln 1-35 and col 9, ln 55-60). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of US 6,573,164 and US 6,573,164 with Kiyoku et al's buffer layer to reduce lattice mismatch between the substrate and nitride semiconductor.

### ***Conclusion***

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 571-272-1468. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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Matthew J Song  
Examiner  
Art Unit 1765

MJS

December 22, 2004



ROBERT KUNEMUND  
PRIMARY EXAMINER